

Appl. No. 09/687,335
Amdt. Dated October 7, 2003
Reply to Office Action of July 7, 2003

IN THE CLAIMS

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1. (currently amended) A method for providing access to a logical unit number of a shared storage system when a hardware failure occurs in a first of multiple input/output paths using a second of the multiple input/output paths, the method ~~comprising mapping~~ comprising: mapping open options of the operating system to SCSI persistent reserve commands to allow all of the multiple paths to register with the logical unit number of the shared storage ~~system and to allow~~ system; and allowing the second of the multiple paths to access the logical unit number of the shared storage system after obtaining a persistent reservation with the shared storage system.
2. (currently amended) The method of claim [[2]] 1 wherein the mapping open options of the operating system to SCSI persistent reserve commands to allow all of the multiple paths to register with the logical unit number of the shared storage system further comprises registering all paths from a first host with the logical unit number of the shared storage system using a single reservation key.
3. (original) The method of claim 1 wherein the mapping open options of the operating system to SCSI persistent reserve commands further comprises obtaining information about persistent reservations and reservation keys.
4. (original) The method of claim 3 wherein the obtaining information about persistent reservations and reservation keys further comprises using a reservation in command.
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5. (original) The method of claim 4 wherein the reservation in command comprises a read key service action and a read reservation service action.

6. (original) The method of claim 1 wherein the mapping open options of the operating system to SCSI persistent reserve commands further comprises issuing a persistent reserve out command for initiating an action with the logical unit number of the shared storage system.

7. (original) The method of claim 6 wherein the persistent reserve out command for initiating an action with a logical unit number of the shared storage system further comprises a service action chosen from the group consisting of register, reserve, release, clear, preempt and preempt with abort.

8. (original) The method of claim 7 wherein the register service action comprises an add and a remove option.

9. (original) The method of claim 7 wherein the add option further comprises:
registering each path when configuring;
determining whether a first registration attempt was a success;
attempting a second registration attempt when the first registration attempt was not a success, setting a state for the path as being dead when the second registration attempt is unsuccessful and ignoring the path when the path has a state set to dead; and
setting a state for the path to true when the first or second registration attempt is successful.

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10. (original) The method of claim 7 wherein the remove option further comprises:

determining whether a path has a persistent reservation;

issuing a persistent reserve out with service option release set when the path is determined to have a persistent reservation; and

releasing the reservation when the when the path is determined to not have a persistent reservation.

11. (original) The method of claim 7 wherein the reserve service action comprises:

deciding whether a device needs to make a reservation to the logical unit number of the shared storage system by examining whether a command parameter is set;

defaulting to a reserve required when a command parameter is not set and implementing a persistent reserve to the logical unit number of the shared storage device when no initiator has reserved the logical unit number of the shared storage device; and when a command parameter is set executing the command parameter.

12. (original) The method of claim 11 wherein the command parameter is a forced open option, the forced open option causing the device to read the current reservation key, preempt and abort queued tasks when the current reservation key does not match the device's reservation key.

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13. (original) The method of claim 12 further comprising:

preventing reservations by setting the command parameter to no reserve;

determining whether the forced open completes successfully;

setting the device's reservation flag to the path index that made the reservation and
opening all paths with no reserve option set when the forced open command complete
successfully; and

issuing an error code when the forced open command does not complete successfully.

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14. (original) The method of claim 11 wherein the command parameter is a retain reservation option, the retain reservation causing the device to read the current reservation key, determine whether a key is returned, establish that the logical unit number is not reserved by an initiator and make persistent reservation when a key is not returned.

15. (original) The method of claim 14 wherein the retain reservation option causes the device to determine whether a returned key matches a reservation key for the device, to issue an error code when the returned key does not match the reservation key for the device, and when the returned key matches the reservation key for the device open all paths with a no reserve option set, set a reserve flag to the path index that made the reservation, set the retain reserve to true and check a retain reserve field at close to determine if persistent reserve should be released.

16. (original) The method of claim 11 wherein the command parameter is a no reserve option, the no reserve option causing the device to read the current reservation key, determine whether a key is returned, establish that the logical unit number is not reserved by an initiator and opening all paths with original command parameter from a host.

17. (original) The method of claim 16 wherein the no reserve option causes the device to determine whether a returned key matches a reservation key for the device, to issue an error code when the returned key does not match the reservation key for the device, and when the returned key matches the reservation key for the device issue a persistent reserve out with release.

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18. (original) The method of claim 11 wherein the command parameter is a default reserve option, the default reserve option causing the device to check all paths, determine whether any paths are unregistered, register all unregistered paths, ignoring any paths that do not register successfully, return and read a reservation key, issuing an error code when the returned reservation key does not match a reservation key of the device and open all registered paths with no reserve set.

19. (original) The method of claim 18 wherein the default reserve option causes the device when a key is not returned to select a registered path, issue a persistent reserve for the selected registered path, ignoring the path if the persistent reservation is not successful, and when the persistent reservation is successful marking a reserve field with the path index that made the reservation and open all registered paths with the command parameter set to no reserve.

20. (original) The method of claim 11 wherein the command parameter is a single option, the single option causing the device to check all paths, determine whether any paths are unregistered, register all unregistered paths, ignoring any paths that do not register successfully, return and read a reservation key, issuing an error code when the returned reservation key does not match a reservation key of the device and open all registered paths with no reserve set.

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21. (original) The method of claim 20 wherein the single option causes the device when a key is not returned to select a registered path, issue a persistent reserve for the selected registered path, ignoring the path if the persistent reservation is not successful, and when the persistent reservation is successful marking a reserve field with the path index that made the reservation and open all registered paths with the command parameter set to no reserve.

22. (original) The method of claim 7 wherein the release service action comprises:

- closing all paths not reserved with a retain reservation option set;
- opening a path with a retained reservation flag set; and
- issuing a persistent reserve out command with a release service action set to release a persistent reservation for a path.

23. (original) A method for supporting SCSI persistent reserve commands by a shared storage system; comprising:

- processing reservation keys to identify registered hosts; and
- processing persistent reservation commands to control access by a host.

24. (currently amended) The method of claim 23 wherein the processing of persistent reservation commands comprises allowing all of the multiple paths to register with the logical unit number of the shared storage ~~system~~ system.

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25. (original) The method of claim 24 further comprising registering all paths from a first host with the logical unit number of the shared storage system using a single reservation key.

26. (original) The method of claim 23 wherein the processing reservation keys comprises obtaining information about persistent reservations and reservation keys.

27. (original) The method of claim 26 wherein the obtaining information about persistent reservations and reservation keys further comprises using a reservation in command.

28. (original) The method of claim 27 wherein the reservation in command comprises a read key service action and a read reservation service action.

29. (original) The method of claim 23 wherein the processing of persistent reservation commands comprises issuing a persistent reserve out command for initiating an action with the logical unit number of the shared storage system.

30. (original) The method of claim 29 wherein the persistent reserve out command for initiating an action with a logical unit number of the shared storage system further comprises a service action chosen from the group consisting of register, reserve, release, clear, preempt and preempt with abort.

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M 31. (original) A driver for mapping open options of the operating system to SCSI persistent reserve commands, the driver configured to process reservation keys to identify registered hosts and to process persistent reservation commands to control access by a host.

32. (currently amended) The driver of claim 31 wherein the driver processes persistent reservation commands by allowing all of the multiple paths to register with the logical unit number of the shared storage ~~system~~ system.

33. (original) The driver of claim 32 wherein the driver registers all paths from a first host with the logical unit number of the shared storage system using a single reservation key.

34. (original) The driver of claim 31 wherein the driver processes reservation keys by obtaining information about persistent reservations and reservation keys.

35. (currently amended) The driver of claim [[346]] 34 wherein the driver obtains information about persistent reservations and reservation keys by using a reservation command.

36. (original) The driver of claim 35 wherein the reservation command comprises a read key service action and a read reservation service action.

37. (original) The driver of claim 31 wherein the driver processes persistent reservation commands by issuing a persistent reserve out command for initiating an action with the logical unit number of the shared storage system.

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38. (original) The driver of claim 37 wherein the persistent reserve out command for initiating an action with a logical unit number of the shared storage system further comprises a service action chosen from the group consisting of register, reserve, release, clear, preempt and preempt with abort.
